

## **A journey through a mass spectrometer – an interactive expedition**

### **Abstract**

This short course attempts to illustrate the journey of a molecule entering a mass spectrometer to finally hit the instrument's detector - from a fundamental physical chemical perspective. We will explore the multitude of options for ionization, the subsequent pressure drop of up-to ten orders of magnitude as well as the various approaches, these instruments handle individual ions and guide them - in a wild adventurous ride - towards the detector. As in space missions, a mass spectrometer accelerates ions within microseconds to speeds that may be orders of magnitude larger than that of space flight rockets leaving Earth. However, care has to be taken as to not overheat and thus destroy fragile molecular structures in specific regions of the instrument. Where are these regions, what are the conditions prevailing here, how much heat is eventually imposed on the ions, and how do physical and chemical transformation processes alter the original, neutral mass information we are eventually seeking for? We are looking forward to welcoming you to a fascinating, space science analogous world. This course will allow you to explore and understand the inner life of instrumentation used in uncountable applications – from space missions to life science – by opening up the black box and eventually holding the essential components in your very hands.

### **Biography Thorsten Benter**

Dr. Thorsten Benter received his Ph.D. in Chemistry from the University of Kiel, Germany, in 1993. After four years as Assistant Professor in the Department of Chemistry at the University of California, Irvine, he returned to Germany and joined the faculty of the University of Wuppertal in 2001 as Ford Environmental Research Professor for 5 years. Since 2001 he is also the chair of the Physical and Theoretical Chemistry (PTC) group as tenured Full Professor. During this time, Dr. Benter served as chair of the Department of Chemistry and as member of several University committees. In 2021, he was elected as President of the German Society for Mass Spectrometry. His research interests include ion/molecule chemistry and dynamics, ionization method development, non-linear laser spectroscopy. The PTC group cooperates with a number partners worldwide in academia (fundamental molecular dynamics and ion separation methods) as well as in industry (mass spectrometry, semi-conductor).

### **Biography Hendrik Kersten**

Dr. Hendrik Kersten received his Ph.D. in Chemistry from the University of Wuppertal, Germany in 2011. In 2012 he was granted a DFG project for the characterization of a miniature spark discharge. This entailed several follow up plasma projects, such as the development of commercially available ionization sources or the characterization of RF and laser induced plasmas. He is particularly interested in the spectroscopy of the VUV and UV-VIS region and the characterization of the underlying plasma chemistry. Currently he summarizes these projects within his habilitation. Since 2017, Dr. Kersten is head of the institute for pure and applied mass spectrometry (ipaMS) at the University of Wuppertal. It provides a platform for other universities, research groups and external partners in the fundamental understanding, experience exchange, development and application of modern mass spectrometry. In this capacity, Dr. Kersten has organized several fundamental MS workshops and established a MS module in the chemistry master curriculum, which includes two lectures and specific lab courses.